I. INTRODUCTION

A. Purpose: To ensure that sprinkler systems installed in any structure and underground fire system installations will provide a satisfactory level of life and property safety.

B. Scope: This regulation will apply to all sprinklered structures including but not limited to industrial, commercial, multi-residential (R-1), and private underground fire lines and hydrant systems. This regulation shall be used in conjunction with NFPA (National Fire Protection Association) #13 and 13R and other applicable codes and standards. This regulation is to be given to the public upon request.

C. Author: The Deputy Chief of the Prevention Services Bureau, through the Assistant Fire Chief (Fire Marshal) of the Fire Prevention Division, is responsible for the origin and maintenance of this regulation.

D. Authority: Los Angeles County Fire Code, Title 32, Sections 101.4, 1001.9, and 1003.2.11.

II. RESPONSIBILITY

A. All individuals and companies who propose to engage in the design, installation, or alteration of fire sprinkler systems and private underground fire lines and hydrant systems are subject to the requirements of this regulation.

III. POLICY

A. All sprinkler systems and private hydrant systems shall be designed and installed in accordance with the California Building and Fire Codes, and NFPA 13. If applicable and approved, a Nationally Recognized Standard may be used (see the Appendix for the current list of standards). This regulation outlines the procedures to be followed when submitting plans, and defines the Department's requirements for installations that may be more restrictive or not found in existing codes.

IV. PROCEDURES

A. Plan Submittal

1. Plans shall be delivered to the Sprinkler Plan Check Unit of the appropriate Department Fire Prevention Office.

ANTELOPE VALLEY	COMMERCE OFFICE
Fire Prevention Office	Fire Prevention Division
Sprinkler Plan Check Unit	Sprinkler Plan Check Unit
335-A E. Avenue K-6	5823 Rickenbacker Road
Lancaster, CA 93535	Commerce, CA 90040
(661) 949-6319	(323) 890-4125

2. A minimum of two sets of plans and calculations shall be submitted for the initial plan check. Four sets of plans including calculations shall be submitted for final approval. Two sets shall be retained by the Department.

3. All plans shall include a completed Fire Flow (Form 196) obtained within one year of the submittal date and verified by a signature of an official of the water company or Department Fire Prevention Division representative. Information shall include: location of the hydrants flowed and gauged, static pressure, residual pressure, size of orifice, pitot reading, observed flow, date and time of test, and backflow prevention requirements.

4. All notes and details shall be incorporated onto the original drawings and printed.

5. Sprinkler plans shall be legible and drawn neatly, and be at a scale not smaller than 1/8" = 1'-0".

6. Underground plans will not be approved until building plans have been approved by the Los Angeles County Fire Department Building Plan Check Unit.

7. Overhead plans, if submitted separately, will not be approved until the underground piping plans have been approved by the Los Angeles County Fire Department Sprinkler Plan Check Unit.

8. Installation shall not begin until plans have been approved. A complete set of approved plans shall be kept at the building site at all times. Contractors installing piping without approved plans may be cited.

B. Design and Installation of Systems

1. Design of overhead and underground fire protection systems shall be performed by individuals/companies meeting the requirements set forth by the State Board of Registration and as follows:

   a. C-16 (only if also the installing contractor)

   b. Registered professional engineer (civil, mechanical)

   c. Registered fire protection engineer

2. The underground fire sprinkler supply line is the piping between the system shut-off valve, or the fire department connection, up to and including the first pipe connection above grade at the building. Such supply lines, and/or any exterior on-site private fire hydrants, may be installed by the following licensed contractor:

   a. General engineering contractor (A)

   b. Fire Protection contractor (C-16)

   c. Pipeline contractor (C-34)

   d. Plumbing contractor (C-36)

C. Minimum Requirements

1. The following required verbatim notes are to be on the blueprints:

   a. It is the responsibility of the owner to properly maintain the fire protection system in an operable condition at all times.

   b. The fire protection contractor will provide the owner with the necessary instruction manuals for the upkeep of the system, as well as a copy of NFPA 25.

   c. Only new sprinklers shall be employed in the installation of the sprinkler system.

d. The system shall only employ the use of approved materials and devices.

e. Fire protection plans shall be approved prior to the installation of any pipe. A set of approved plans shall be maintained at all times at the job site.

f. An appointment shall be made a minimum of two working days in advance, with the appropriate Fire Prevention Division regional office for all inspections and tests.

g. All underground mains and lead-in connections shall be flushed, as indicated in NFPA prior to connecting to the overhead piping. The flushing shall continue until the water is clear. Flushing should be performed at the time of the hydrostatic test, and shall be witnessed by a Fire Prevention Division inspector.

h. System piping shall be hydrostatically tested at 200 psi for two hours or at 50 psi above the maximum system operating pressure, whichever is greater.

i. Fire department connections shall be located on the address side of the building, face the street, be visible and accessible, have NST female inlets, have protective caps, and an accessible, approved check valve located in the main line (as close to the inlets as possible).

j. All valves and fire department connections shall have permanently affixed signs, indicating their function.

k. A stock of spare sprinklers of each style, type, and temperature rating along with a sprinkler wrench shall be located at the main riser.

l. Any portion of a wet fire protection system exposed to freezing temperatures shall be adequately protected. (Heat tape is not an acceptable method of protection).

m. Welding shall be performed per NFPA 13 requirements.

n. Automatic sprinkler systems shall be supervised by a listed/approved central, proprietary, or remote station, or a local alarm when approved by the Chief, which will give an audible signal at a constantly attended location when the number of sprinklers is 100 or more.

Exception: 20 or more in Group I, Division 1.1 and 1.2 occupancies.

2. The following required verbatim notes are to be on the blueprints only when a private fire hydrant is proposed.

a. All private fire hydrants shall flow a minimum of 1250 gpm at 20 psi for duration of two hours. If more than one on-site fire hydrant is required, the on-site fire flow shall be at least 2500 gpm at 20 psi, flowing from the most hydraulically remote hydrants simultaneously. On-site flows shall match the public flow requirements.

b. All private on-site fire hydrants shall be installed a minimum of 25 feet from a structure or protected by a two-hour firewall to the highest portion of the building, adjacent to the hydrant.

c. Each private fire system shall have a main post indicator valve, or other approved valve, at the city connection on the system side of the detector check valve.

d. All private on-site fire hydrants shall be equipped with a shut-off (gate) valve, which is located at least 10 feet, and not more than 25 feet, from the fire hydrant. The location may be less than 10 feet when the water main is existing, and the 10-foot minimum distance cannot be satisfied. The shut off valve shall be readily accessible at all times (locating it under a parking stall is not allowed).

e. All private on-site fire hydrants shall be installed to the following specifications, prior to flow test and acceptance of the system:

(1) Installed so that the centerline of the lowest outlet is between 14 and 24 inches above finished grade

(2) Installed so that the front of the riser is between 12 and 24 inches behind the curb face

(3) Installed so that the outlets are facing the curb at a 45-degree angle to the curb line

(4) Of a type and construction which conforms to current American Water Works Association Standard C503

(5) Provided with a 3-foot unobstructed clearance on all sides

(6) Installed so that the fire hydrant is centered on a 3' x 3' x 1' thick concrete pad

(7) Properly treated prior to paint application, and painted with two coats of primer and one coat of “Fire Engine Red” paint

(8) Provided with approved plastic outlet caps

f. All private on-site water mains, laterals, gate valves, buries, and risers feeding private fire hydrants shall be a minimum of six inches in diameter.

g. When sidewalks are contiguous with a curb and have a width of five feet or less, the front of the fire hydrant riser shall be placed immediately behind the sidewalk. In no case shall a fire hydrant be more than six feet from a curb face.

h. Approved fire hydrant barricades shall be installed if curbs are not provided (see Regulation 8).

i. All on-site fire hydrants and underground installations are subject to inspection of the following items by a representative of the Department:

(1) Piping materials, thrust blocks, and the bracing and support thereof

(2) Piping shall be hydrostatically tested at 200 psi for two hours or at 50 psi above the system operating pressure, whichever is greater

(3) Adequate (10 feet per second) flushing of the piping, in accordance with NFPA 13

(4) Flow test to satisfy fire flow requirements

j. It shall be the responsibility of the property management company, the homeowner's association, or the property owner to maintain on-site fire hydrants at all times.

3. The following information shall be provided on the plans:

a. Name of owner or occupant

b. Location, including street address and city

c. Installing contractor's name, address, telephone number, license type and number

d. Ceiling/roof construction details, including the spacing of members

e. Full height cross section, to include mezzanine areas or difficult to understand areas

f. Location of rated and full height walls

g. Location of partitions

h. Occupancy class of each room or area to determine the proper hazard classification

i. Location and size of concealed spaces and all unsprinklered areas

j. Size of city main, and if circulating or dead-end

k. Elevations of tank, water supply, pump, and structures as they relate to each other, as applicable

l. Location, number of inlets, and size of the fire department connection

m. Location of closest public fire hydrant to the fire department connection

n. All sources of water supply

o. Make, model, sprinkler identification number (S.I.N.), response type, temperature rating, and nominal orifice size (“K” factor) of all sprinklers

p. Total square footage of building

q. Total square footage per riser per floor

r. Total sprinkler count by style

s. Make, type, and model of valves

t. Location of exterior alarms

u. Pipe make, size, class, type, internal diameter, and C-factor

v. Nominal pipe size, and cutting length of pipe (or center to center)

w. Location, size, and length of all riser nipples

x. Type of fittings, couplings and joints, and their location

y. Type and location of all hangers for the mains and branch lines. A typical hanger location detail is sufficient

z. Hanger detail. (Information to include size of rods, and size and type of fasteners). When piping greater than 4” is supported by a lightweight roof structure (i.e. bar joist, composite wood joist, Z-purlins, etc.), structural review/approval by a registered professional engineer is required to verify the roof structure is adequate to support the weight of the water filled piping plus 250 pounds applied at the point of hanging.

aa. Location and details of lateral and longitudinal sway bracing, including spacing, zone of influence loads, angle, fastener type and size. When piping greater than 4” is supported by a lightweight roof structure (i.e., bar joist, composite wood joist, Z-purlins, etc), structural review/approval by a registered professional engineer is required to verify the roof structure is capable of carrying the added applied seismic loads.

bb. Test connections, main drain, and inspectors test valve

cc. Indicate size, location, type of nozzle, and length of hand held hose

dd. Indicate location, type, and size of fire department connection

ee. Indicate location of exterior control valve

ff. Type and size of underground pipe

gg. Type of underground fittings

hh. Depth of bury

ii. Location of thrust blocks and details

jj. Make, model, and type of the backflow prevention device

kk. Key plan showing the location of tenant work, in relation to the existing building or structures

ll. Design criteria for the system

mm. Calculation information, stating the system design pressure and flow at the base of the riser

4. The following information shall be contained on the hydraulic calculations:

a. Sprinkler “K” factor

b. Justification for altered “K” factor

c. Hydraulic reference points

d. Current water flow test information

e. Pipe size, with internal diameters

f. Pipe length

g. All fittings

h. Friction loss per foot

i. Total friction loss between reference points

j. Elevation in psi at each reference point

k. Required pressure at each reference point

l. A standard cover sheet with all necessary information

m. A water supply curve, including a 10% reduction

n. In rack sprinkler demand, if applicable, balanced with the overhead system

o. Inside and outside hose demands at their respective connection points

D. System Acceptance Tests

1. Hydrostatic test (minimum 200 psi for two hours, or at 50 psi above the system operating pressure, whichever is greater) shall be conducted on all new systems, upgrades, or partials that involve the installation of over 20 heads. Above ground piping modifications that cannot be isolated shall not require testing in excess of the system working pressure.

   a. When sprinkler heads are replaced as required after 50 years of service, it is <u>not</u> the intent of this regulation to require hydrostatic testing.

2. Underground piping and fittings shall not be covered or connected to the overhead piping until a hydrostatic test and inspection has been completed. (Center loading is permissible.)

3. Above ground piping and fittings shall not be concealed until a hydrostatic test and inspection has been completed.

4. A final inspection by Department personnel is required on all systems.

E. Fire Department Connection (FDC)

1. One FDC shall serve all automatic sprinkler systems on a subject property.

Exceptions:

a. When a property has separate buildings with individual addresses, separate independent FDCs shall be required for each building.

b. More than one FDC may be required when unique situations exist as determined by the Department Sprinkler Plan Check Unit.

2. The FDC shall be installed on the address side of the building within 150 feet (via vehicular access) of an accessible public fire hydrant. The FDC shall be located as close to the street curb face as possible.

3. The FDC shall be visible, accessible (three feet clear above and on both sides) and installed with the inlets not less than 24 inches and not more than 42 inches above the level of grade, with the FDC facing the street. When a fence or other obstruction is provided, the FDC shall be accessible from the public side of the obstruction.

   When unique public main situations exist (i.e., easements, etc.), early contact with the Department Sprinkler Plan Check Unit is encouraged.

4. Existing automatic sprinklered buildings, with upgrades or additional installation of over 20 sprinklers that do not conform to (1) and (2) (above) shall require a second FDC which will be able to serve the entire system, and which meets the requirements of this regulation.

5. Signs shall indicate the type of system, address, buildings served by the FDC, and system pumping pressure if greater than 150 psi. Signs shall be provided as outlined in Section F, Item 7.

6. FDCs shall be located a minimum of 25 feet from the structure. When this distance cannot be achieved, a minimum two-hour fire resistive wall shall be provided with no openings in the wall, 25 feet in either direction of the FDC.

7. Systems designed for a total water demand up to 1,000 gallons shall be provided with a single, listed, clappered body FDC, having two 2 ½” inlets siamesed into a minimum 4" pipe with a 4” check valve.

Exception: residential systems designed for a total water demand of less than 100 gpm are allowed to have a one-way, 2 ½" FDC with appropriate sized piping and check valve.

8. Systems designed for a total combined water demand exceeding 1,000 gpm up to 2,000 gpm shall be equipped with a single, listed, clappered body FDC, having four 2 ½" inlets siamesed into a minimum 6" pipe with a 6" check valve.

9. Systems designed for a total combined water demand exceeding 2,000 gpm shall be equipped with a single, clappered body FDC, or approved equal, having six-2 ½" inlets siamesed into a minimum 6" pipe with a 6" check valve.

10. The combined water demand for FDC sizing shall be determined by adding the highest single system demand to the inside hose or standpipe system, if provided, and if there is a private hydrant, outside hose requirement.

11. When an FDC is designed to pressurize more than one private hydrant as well as the sprinkler systems, a minimum of 1,000 gpm shall be used as the outside hose requirements for determining the combined water demand for FDC sizing. Assume 500 gpm maximum for each FDC inlet.

12. The FDC pipe sizing shall be sized to provide the highest single sprinkler system demand plus any inside and outside hose demands, or standpipe system demand, based on a maximum pressure of 150 psi at the FDC inlets.

F. System Control Valves

1. System control valves shall be of an indicating type valve assembly. Underground gate valves are not acceptable for sprinkler system control valves.

2. Each sprinkler riser shall have a readily visible, accessible above grade exterior indicating control valve.

3. Each fire protection system shall have a main post indicator valve located at the city connection, on the supply side of the FDC.

   a. Systems with a backflow prevention device may use the system side OS&Y valve to meet the requirements stated in Item 3 (above), provided the valve is clearly visible and accessible at all times from the fire department access road.

b. Wall post indicator valves may be used as the systems main control valve were short lengths of underground exist. A listed indicating control valve may be used only when the riser is on the exterior of the building and readily visible and accessible. Note: The FDC shall be tied in on the system side of this control valve when feeding a single sprinkler system.

4. In multi-story/level buildings (including basements) over three levels, the following devices shall be provided at each floor level in a rated shaft or stairway:

   a. Indicating control valve

   b. Water flow detector with an alarm bell

   c. Drain valve

   d. Inspectors test valve with sight gauge

5. Sectional control valves for underground fire mains shall be post indicator type (PIV). In unique situations when above ground valves cannot be used, a central station service monitored electronically supervised indicating valve in an approved vault may be allowed. Valves shall be provided as follows:

   a. Provide a sectional control valve on each side of the supply connection to the loop and one at the opposite side of the loop. This also applies to systems which "Y" or split into two or more separate legs, but do not actually complete a loop.

   b. Sectional control valves shall be required for each combination of five sprinkler risers and/or hydrants. Rack sprinkler risers need not be counted when determining these units.

6. Underground piping serving both on-site hydrants and sprinkler systems shall be designed whereby on-site hydrants will not be shut off when the sprinkler systems exterior control valve is turned off.

7. System control valves and FDCs shall have a permanent sign identifying areas or systems controlled. Signs shall be metal, painted white with minimum red letters 1" high with 3/16" stroke and shall be permanently banded to the valve or permanently affixed to a wall.

8. All control valves shall be locked in the open position, with a non-

case-hardened lock.

9. All control valves shall be readily accessible and located within 7’-0” above the floor.

10. Sprinkler systems located in special hazard areas (i.e., spray booth, trash chutes, etc.) shall have a separate indicating control valve. This valve shall be supervised in the same manner as the building’s sprinkler system control valve.

G. System Components

1. Alarms:

a. An exterior alarm bell shall be provided for each riser and shall be located adjacent to that riser in order to clearly identify which riser is flowing water.

b. In multi-story buildings, alarm bells/horns shall be located on each floor, adjacent to the floor control valve. In addition, one bell shall be located on the exterior of the building, adjacent to the main riser.

2. Spare sprinklers and a sprinkler wrench shall be located on the premises, near a riser or a sign at the riser to indicate the location of spare sprinklers. Spare sprinklers shall be accessible to the fire department at all times.

3. All fire protection equipment that is susceptible to mechanical damage shall be provided with barricades. (See regulation 8)

H. Underground Piping

1. Underground piping shall not run under a building’s footprint or structure.

2. Underground supply pipe may run up to a maximum of 10 feet in length under a building’s footprint or structure to supply a riser, which cannot be located directly adjacent to an exterior wall. No pipe joints are allowed in the piping under the building except for the fitting at the rise up.

3. Any pipe located under a building shall be ductile iron or listed as equal.

4. Thrust blocks shall be designed based on a safety factor of 1.5, or a

minimum water pressure of 150 psi, whichever is greater.

5. Copper piping shall be type “K” with brazed joints.

6. Underground piping shall not cross property lines.

   Exception: A recorded easement on the supplying owners deed and covenants, conditions and restrictions (CC&Rs) approved by the Department.

I. Special Occupancies

1. Spray booths:

   a. Shall have a separate control valve and drain.

   b. Shall be designed in accordance with the Extra Hazard Group 2 Occupancy requirements, as outlined in NFPA 13. If the system exceeds eight heads, or has a supply run of greater than 100’-0”, hydraulic calculations shall be provided.

   c. Sprinklers shall be protected from the accumulation of foreign matter with cellophane bags having a thickness of 0.003 inches (0.076 mm) or less, or thin paper bags.

   d. Sprinklers shall be accessible for periodic inspection.

   e. Sprinkler heads shall be placed in the following locations:

      (1) In the spray booth with additional heads located behind the filter

      (2) In the exhaust stack at the base, and not less than 6" above building roof line

      (3) Within the horizontal exhaust ducts greater than 10” diameter

   f. A separate indicating control valve and riser shall be provided for each spray booth.

2. Hoppers for the collection of combustible materials.

   a. Shall be protected with automatic sprinklers

   b. Shall be calculated as Extra Hazard Group1, per NFPA 13

c. Shall have a separate control valve and drain

d. Sprinkler heads shall be placed in the following locations:

(1) At the top of hopper

(2) At the base of hopper

e. Sprinklers shall be protected from the accumulation of foreign matter with cellophane bags having a thickness of 0.003 inches (0.076 mm) or less or thin paper bags, and regularly checked for damage and replaced as needed.

J. Complete Protection

1. When sprinkler protection is required in a structure, sprinklers shall be provided throughout 100% of the structure.

Exceptions:

a. Existing buildings legally in use at the time of construction and not involving a change in occupancy classification, provided such continued use is not dangerous to life or property

b. In new buildings when separated from all other portions of the building by an area separation wall, with approval of the Department

c. For minor accessory uses (i.e., trash chutes, spray booths, dumpsters, coolers, etc.).

2. Sprinkler protection shall be installed in any area where an obstruction from the overhead protection, exceeding four feet by four feet is created (length and width) for standard sprinklers.

3. Alternate fire protection does not exempt required fire sprinkler protection. Alternate fire protection may be used in conjunction with sprinklers in specific applications.

4. If an occupant chooses to remove sprinkler protection from a structure where protection is not required by any existing code, all physical and visual evidence of that system shall be removed.

5. In building upgrades or remodels that require fire protection system materials to be abandoned, all non-used materials and equipment shall be removed.

K. Hydraulically Designed Systems

1. A 10% reduction in available water pressure shall be provided for all new and upgraded hydraulically calculated sprinkler systems. This will be accomplished by reducing the static and residual pressure by 10% and drawing the new curve. Total system demand and hose stream allowances shall be added together and shall not exceed this new curve.

2. Existing sprinkler systems which have been hydraulically calculated shall have new calculations provided any time the system is altered to the point where there is a question as to the location of the hydraulically most remote area.

3. Sprinkler systems which have been hydraulically calculated shall not have pipe schedule additions. These additions shall be calculated.

4. Buildings which will have future tenant improvement sprinkler work, must have provisions made in the original hydraulic calculations for this future work.

5. When an existing building provided with a pipe scheduled system is proposed to be used for “High Piled Stock” or have the addition of in-rack sprinklers, the existing roof sprinklers shall be calculated in accordance with the most current adopted standard (see the Appendix for that specific application).

6. Hydraulically calculated systems shall be calculated back to the public water supply.

L. Smoke Vents/Skylights

1. Sprinklers shall not be located in or below smoke vents or standard (4’ x 8’) skylights.

2. Custom or recessed skylights may require sprinkler protection.

M. Tandem Systems

1. Tandem systems are not permitted by this Department

a. Definition: A sprinkler system in a detached building which is supplied from the overhead fire sprinkler system piping of another building or has its supply piping running through the other building.

N. Tenant Spaces

1. Head spacing in unleased or undeveloped tenant space shall be provided with standard coverage 1/2 " orifice heads in 1" outlets and designed to the appropriate hazard classification of the anticipated tenant. Deflector distances shall be maintained in accordance with NFPA 13. Hydraulic calculations shall be provided using an altered "K" for the typical arm-over and flow based on the maximum head spacing anticipated. When the space is developed, the addition of heads shall be restricted to one head per outlet. More than one head may be taken from an existing outlet, when calculations have been provided to justify such.

O. Special Requirements

1. All underground mains serving private on-site fire hydrants shall be calculated to verify the required on-site fire flow.

2. Any standard for protection used to design a system other than the County of Los Angeles Fire Code, Title 32, County of Los Angeles Building Code, Title 26, or appropriate NFPA Standard, must be approved by the Department, Sprinkler Plan Check Unit.

3. Fire hose racks shall be equipped with 100 feet of 1 1/2" lined hose and approved fog nozzle.

4. When a fire pump is utilized in a system, a maximum of 125% of its rated capacity may be used in the design of the system.

5. When a fire pump is utilized in a system, the water supply shall be adequate to supply the pump at 150% of its rated capacity, and shall be tested at 150%.

6. When a fire pump is provided, the pump and related equipment shall be located in a separate enclosed room of one-hour fire resistive construction, and provided with sprinkler protection.

7. Sprinkler heads with the same orifice size shall be utilized within the same area or compartment.

8. When pressure-reducing valves (PRV) are used, an approved device for full flow testing shall be provided after the valve and discharged to an approved location. A minimum 2" main drain valve shall be provided when using 2 ½" PRV's.

9. Class 1 standpipes for non-high rise buildings shall be designed as manual wet, and calculated such that a maximum 150 psi is required at the FDC to provide the minimum residual pressure required at the most remote valve outlets.

10. Sprinkler heads located less than 7'-0" above the floor shall be protected from damage in an approved manner.

11. Sprinkler protection shall be provided under all canopies or over hangs greater than 4'-0" wide above hardscape areas of mercantile occupancies.

12. All dry type sprinkler systems shall be designed and tested to provide water to the most remote portion of the system within 60 seconds.

13. All sprinkler systems designed with a density of .25 gpm or greater shall not exceed 40,000 square feet per riser.

14. Automatic sprinkler systems with non-fire protection connections are not allowed.

15. Water curtain protection as a substitute for a rated wall shall be approved by the jurisdictional building official.

P. Water Supply

1. In rural areas where public water is not available, water storage requirements shall comply with NFPA 1142, with the tank size approved by the Department Building Plan Check Unit.

2. Water supplies used for fire protection systems shall be from reliable sources. Domestic water service is not considered a reliable source.

   Exception: Residential (R) occupancies designed as NFPA 13R may be allowed to use the domestic service, if adequately sized to handle both the domestic and fire sprinkler needs.

APPENDIX

NFPA 11	-	1998	NFPA 16	-	1999
NFPA 11A	-	1999	NFPA 20	-	1999
NFPA 13	-	1999	NFPA 22	-	1998
NFPA 13R	-	1999	NFPA 230	-	1998
NFPA 14	-	2000	NFPA 1142	-	2001
NFPA 15	-	1996			